POCKET COMPUTER NEWSLETTER

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SHARP ELECTRONICS ANNOUNCES THE PC-1500

Sharp Electronics has announced that in February it will begin shipments of its second generation pocket computer. The model has been designated the Sharp PC-1500.

The new unit is housed in a 7-11/16 by 1 by 3-3/8 inch case and has a weight of slightly more than 13 ounces. It will operate for 50 hours of four internal batteries. Power is automatically conserved when the computer is not in use through a shut off feature that powers down the display and CPU while still conserving the contents of memory.

The unit contains a 16 kilobyte ROM that holds the operating system and an advanced version of the BASIC language. A total of 3.5K of RAM is included in the unit. Of this, 900 bytes are reserved for use by the operating system, 1850 bytes serve as the user's program/data area, 624 bytes are used for fixed variables A – Z (or A$ – Z$) and 188 bytes are available for "reserve" routines. An optional accessory, the CE-151 Memory Module, provides an additional 4K of user memory. This module is plugged directly into the back of the PC-1500 and does not increase its physical size.

A custom designed CMOS 8-bit processor driven by a 1.3 megahertz crystal clock provides fast operation. The crystal clock circuitry also provides programmable timing functions that can indicate time to the month, day, hour, minute and second.

The PC-1500 is capable of producing audio tones under program control.

The BASIC language interpreter provides the following commands: RUN, NEW, LIST, CONT, TR ON, TR OFF, LOCK, UNLOCK, STATUS and MEM. It supports the statements: INPUT, PRINT, GPRINT, CURSOR, GCURSOR, PAUSE, USING, WAIT, CLS, IF. . . THEN, STOP, GOTO, ON. . . GOTO, GOSUB, ON. . . GOSUB, RETURN, ON ERROR GOTO, FOR. . . TO. . . STEP, NEXT, END, DIM, LET, REM, DATA, READ, RESTORE, BEEP, AREAD, ARUN, CLEAR, RANDOM, DEGREE, RADIAN, GRAD, BEEP ON, BEEP OFF. The following functions are provided: SIN, COS, TAN, ASN, ACS, ATN, LN, LOG, EXP, DEG, DMS, RND, SQR, SGN, ABS, INT, PI, LEFT$, RIGHT$, MID$, ASC, VAL, LEN, CHR$, STR$, POINT. The interpreter can process two-character variables as well as two-dimensional numeric and string arrays. It also provides the special directives: INKEY$ and TIME.

The unit sports a QWERTY keyboard with numeric pad and six special programmable keys that may be programmed to provide up to 18 different functions or operations.

A 7 by 156 dot display can be programmed in a graphics mode or in an alphanumeric text mode, producing both upper and lower case.

Sharp supplies the unit complete with a soft carrying case, a set of four batteries, 2 keyboard templates, an applications manual and an instruction manual.

New Printer/Plotter with Dual Cassette Interface Also Announced

Along with the PC-1500, Sharp has announced a companion unit that is able to print and/or plot in four colors as well as control two audio cassette units!

The CE-150 is being called a Color Graphic Printer by Sharp Electronics. It is capable of operating in two modes. In the text mode, it can output 4, 5, 6, 7, 9, 12, 18 or 36 characters to a line at a rate of up to 11 characters-per-second. Characters can be printed on a character-by-character basis in the colors red, blue, green or black. In the graphics mode, the unit is operated as an X–Y axis plotter system with a resolution of 1/64 inch.

The CE-150 is controlled by the BASIC commands LLIST, TEST, CSAVE, CLOAD, CLOAD? and MERGE, as well as the statements LPRINT, TAB, LF, ROTATE, COLOR, USING, GLCURSOR, SORGN, LINE, RLINE, CSIZE, TEXT, GRAPH, INPUT#, PRINT#, CHAIN, RMT ON and RMT OFF.

The CE-150 weighs just two pounds, runs on rechargeable batteries, and measures 13 by 2 by 4-1/2 inches.

Photo *The Sharp PC-1500 Pocket Computer Mounted in the CE-150 Printer/Plotter & Dual Cassette Interface*

Another *Personal Information*™ product from SCELBI Publications.

RADIO SHACK ANNOUNCES NEW POCKET COMPUTER

Radio Shack has obviously teamed up with Sharp Electronics again to provide what it is calling the TRS-80 Pocket Computer Model PC-2.

The new PC measures 1-1/16 by 7-11/16 by 3-3/8 inches. It can operate for up to 50 hours on four internal AA batteries or be operated using an optional alternating current power supply.

The new PC sports a much more powerful BASIC interpreter than its smaller predecessor. The new interpreter and operating software reside in 16 kilobytes of ROM within the PC-2. The interpreter executes 42 statements, 34 functions and 6 commands. Greatly enhanced string handling capability provides for 2-dimensional string arrays having up to 80 characters per element. String operations include: LEFT$, MID$, RIGHT$, LEN, VAL, CHR$ and STR$. While being much more powerful, this extended version of BASIC is still compatible with the earlier TRS-80 PC BASIC. Thus programs prepared for the earlier unit can be immediately loaded and executed on the PC-2! The language provided can be extended even further by mating the PC-2 with "intelligent" peripherals.

The PC-2 is supplied with user memory that allows up to 1850 bytes of storage for a BASIC program or data, 600 bytes of fixed data memory and 190 bytes of reserve memory. However, the unit will also accept a plug in memory module that will permit user storage to be expanded by as much as 16K. A variety of such modules have been promised to allow a user to mix both RAM and ROM elements. Initially, a 4K memory module will be available providing the PC-2 with approximately 6.6K of "user"memory.

The new model carries a QWERTY typewriter-format keyboard containing 65 alphanumeric keys. Six of these keys may be programmed to provide up to 18 functions, 18 may be operated as "soft-keys," and 10 may serve as pre-programmed command keys.

The PC-2 also features a liquid-crystal display that will please many users. In standard use, it displays full 5 by 7 dot alphanumeric characters in both upper and lower case. The display can also be addressed as a 7 by 156 dot matrix graphics unit! Thus, special character sets and graphics effects can be generated.

The new unit also has substantial processing speed. A specially designed 8-bit CMOS central processor unit with a 1.3 Megahertz clock provides an operating speed that is roughly ten times greater than the earlier TRS-80 Pocket Computer. The design of the system also permits direct memory access plus the ability to perform maskable and timer interrupts.

Included in the basic unit is a real time quartz clock system. The clock can be accessed from a BASIC program or the keyboard. It can provide month, day, hour, minute and second timing operations and readouts.

To facilitate its application for use as a process controller, data logger or instrument monitor, the PC-2 is equipped with a 60-pin input/output connector that provides access to address, data, interrupt, timing and CPU control signals.

Radio Shack Computer Centers, stores and participating dealers are scheduled to begin carrying the PC-2 in the second quarter of 1982. The price of the new Radio Shack TRS-80 Pocket Computer Model PC-2 has been announced as $279.95 in the U.S.

RADIO SHACK ANNOUNCES FOUR-COLOR PRINTER/PLOTTER COMBINED WITH DUAL CASSETTE INTERFACE FOR THE PC-2

The first peripheral announced for the new PC-2 is a combination unit that again provides significant capability over its predecessor.

The printer/plotter portion of the unit uses a drum plotter type of mechanism. Four miniature ball point pens are mounted on a disk. The disk can be rotated to select a particular pen color. The unit is equipped with software intelligence that adds twenty-five BASIC statements and commands to the PC-2 specifically for printing, plotting and graphing operations. Using these special instructions, a user can direct the unit to print text in nine different character sizes ranging from 4 to 36 characters per line. Or, the unit may be directed to draw full X/Y/Z axis graphics using any of the available pen colors.

The printer/plotter uses ordinary 2-1/4 inch wide cash-register or calculator type paper which is inexpensive and widely available!

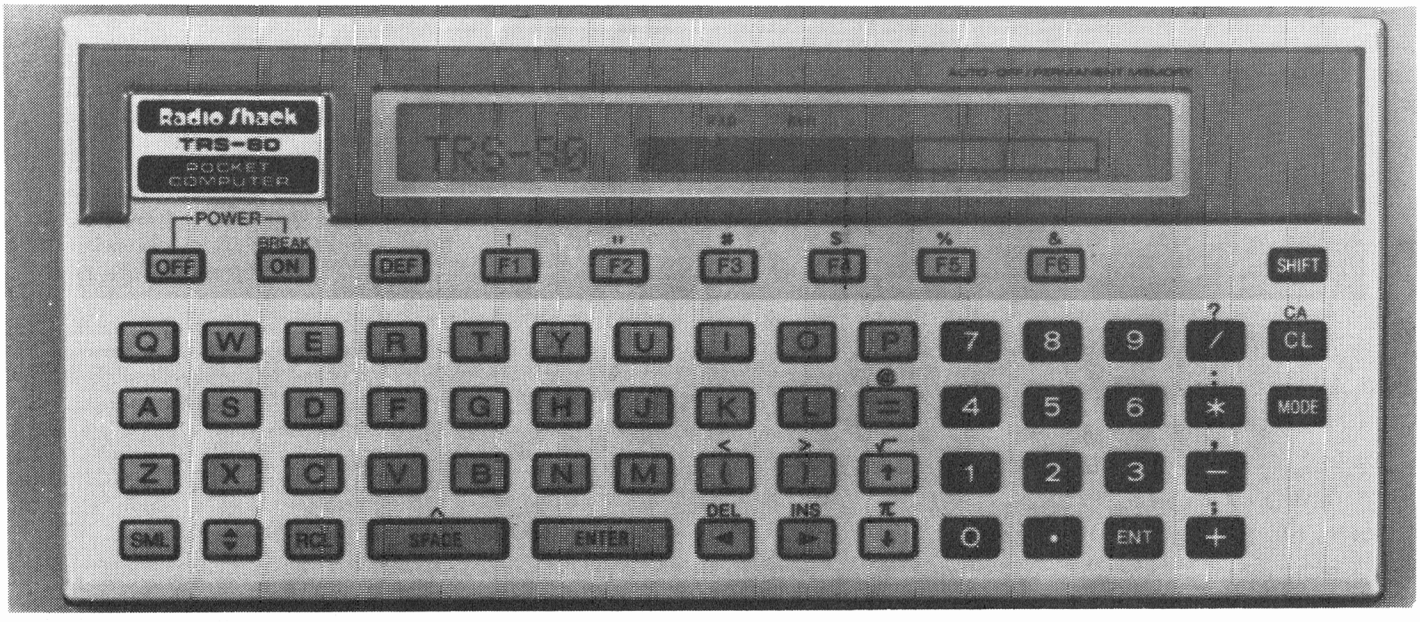
Resolution of the printer/plotter unit is specified at an astounding 0.2 millimeters on a grid of 216 by 512 positions, making it possible to draw amazingly accurate pictorials and artwork.

Along with the printer/plotter is a dual cassette control unit. This permits a user to simultaneously control two separate ordinary audio cassette recorders, thus providing automatic program overlay, data storage, chaining or acquisition of data from one unit while storing updated information on another. Furthermore, this interface can be combined with a future RS-232C interface and modem so that a complete data communications and logging system can be assembled.

Finally, the unit extends the 60-pin input/output connector so that all of the operating signals from the PC-2 can still be accessed when the interface is in use.

The unit is scheduled for U.S. delivery in mid-1982 and has an announced U.S. price of $239.95.

Photo *The Radio Shack PC-2 Pocket Computer*



AN INTERPOLATION PACKAGE

The accompanying program provides three methods of interpolation: linear, Lagrangian and first or second order least squares. The least squares routine also provides a curve fit through the given data points. The program is designed to run with the Radio Shack TRS-80 or Sharp PC-1211 PC in the DEF mode.

Linear Interpolation

Use SHIFT/A to perform linear interpolation. Data is inputted as X,Y pairs. The user is then prompted for a value of X and the program determines Y(X). The routine is suitable for extrapolations.

Lagrangian Interpolation

Begin execution of this routine by using SHIFT/B. Input the number of data points (maximum is about 70) and the X and Y values for each point. Input the value of X at which to find Y(X) when prompted. Execution time is a function of the number of points inputted. This type of interpolation fits a polynomial of order N-1 through the N data points specified. Since higher order polynomials may behave strangely, it is best to use as few data points as possible. Extrapolation using this routine can be risky.

Program *Interpolation Package*

```
10  "A":PAUSE "LINEAR INTERPOLATION":
    INPUT "X1=";A,"Y1=";B
20  INPUT "X2=";C,"Y2=";D:G=(D-B)/(C-A)
30  INPUT "X=";X:Y=(X-A)*G+B:PRINT "Y=";Y:
    GOTO 30
40  "B":PAUSE "LAGRANGIAN INTERPOLATION":
    INPUT "# X,Y PAIRS=";E
50  FOR I=1 TO E:B=11+(I-1)*2:D=B+1
60  INPUT "X(I)=";A(B),"Y(I)=";A(D):NEXT I:
    INPUT "X=";A
70  G=0:FOR I=1 TO E:F=1:B=11+(I-1)*2:D=B+1:
    FOR J=1 TO E
80  C=11+(J-1)*2:IF B=C GOTO 100
90  F=F*(A-A(C))/(A(B)-A(C))
100 NEXT J:G=G+F*A(D):NEXT I
110 BEEP 1:PRINT "Y=";G:INPUT "X=";A:GOTO 70
120 "C":CLEAR:PAUSE "LEAST SQUARES":
    INPUT "# X,Y PAIRS=";A
130 FOR I=1 TO A:INPUT "X(I)=";X,"Y(I)=";Y:
    B=B+X:C=C+X*X
140 D=D+X*X*X:E=E+X*X*X*X:F=F+Y:G=G+X*Y
150 H=H+X*X*Y:NEXT I:INPUT "1ST OR 2ND
    ORDER?(1,2)";J
160 IF J=2 GOTO 180
170 K=A*C-B*B:L=F*C-G*B:M=A*G-B*F:N=0:
    GOTO 220
180 K=A*(C*E-D*D)+B*(D*C-B*E)+C*(B*D-C*C)
190 L=F*(C*E-D*D)+G*(D*C-B*E)+H*(B*D-C*C)
200 M=A*(G*E-D*H)+B*(C*H-F*E)+C*(F*D-G*C)
210 N=A*(C*H-D*G)+B*(F*D-B*H)+C*(B*G-C*F)
220 X=L/K:Y=M/K:Z=N/K:BEEP 2:PRINT "A0=";X
230 PRINT "A1=";Y:PRINT "A2=";Z
240 INPUT "X=";A:B=X+Y*A+Z*A*A:PRINT "Y=";
    B:GOTO 240
```

Least Squares Interpolation

Use SHIFT/C to perform least squares interpolation and curve fitting. Data is inputted as X,Y values, but the number of points allowed is unlimited! You may then select first (linear) or second (quadratic) order curve fitting. The coefficients of the polynomials are calculated by the program and displayed. Coefficients are assigned as follows:

$$Y(X) = (A0) + (A1)X + (A2)X^2$$

Coefficient A2 will always be equal to zero for a first order fit. After the coefficients have been presented, the user is prompted for a value of X at which the program will find Y(X).

As a rule, a least squares fit does not pass exactly through the data points. Rather, it provides a smooth curve such that the sum of the squares of the distances from the curve to each data point is minimized. Thus, this routine is best when experimental data is likely to have random errors.

Having all three types of interpolation routines available in the PC at one time (with room to spare) is an advantage.

These routines were provided by: *Paul T. Meredith, P.O. Box 784, Issaquah, WA 98027.*

SUPER-WUMPUS REVISITED

Gary Heidbrink, author of the program, has replied to the suggestions made by *Joseph P. Jones*, which were published in Issue 10 of *PCN:*

Do not alter line 5. It is used for other purposes that will limit the scope of the game if modified. Do not change line 105. IF K is the same as IF K=1, but takes less memory. Line 95 does need the colon before GOTO 40 as stated by Mr. Jones. Change the word ARROWS in line 170 to ARROW. Now change line 200 to read:

```
200 W=M:GOSUB 10:GOSUB 5:T=INT (27-H/5):M=A(T)
```

This corrects the problem discovered by Mr. Jones while keeping an even spread as to which room the Wumpus will move.

A MESSAGE FOR AUTHORS

PCN invites the submission of quality programs for pocket computers as well as practical application and tutorial articles of specific interest to users of pocket computers.

PCN purchases all rights to accepted materials at rates ranging from $50 to $150 per finished page as it appears in *PCN.* The payment rate is highly dependent upon the editorial and technical quality, timeliness and general suitability of the material for our readers.

Please double-space all manuscript material. Include a clean printer listing and a tape cassette copy of substantial listings. Be sure and include a self-addressed, stamped envelope if you desire the return of material that has been submitted for our consideration.

We keep all materials, including cassette tapes, and provide an Author's Agreement when a submission meets our requirements.

Since all submitted material must be critically evaluated and reviewed, it may take three to six weeks before any decision regarding a submission is made.

PCN also welcomes letters to the editor that express opinions, provide operating tips, programming tricks or news and general information of interest to fellow users of pocket computers. Selected material from such letters may be published, without monetary renumeration, as a service to subscribers.

Please direct all submissions for editorial review to:

The Editor
POCKET COMPUTER NEWSLETTER
35 Old State Road
Oxford, CT 06483

CALENDAR PROGRAM

Input the month and year for any time between March, 1700 and February, 2200 and this program will output a calendar!

```
 S  M  T  W  T  F  S
          1  2  3  4  5  6
 7  8  9 10 11 12 13
14 15 16 17 18 19 20
21 22 23 24 25 26 27
28
```

Program *Calendar (Printer Version)*

```
15  CLEAR:F$=" 1":G$=" 2":H$=" 3":I$=" 4":J$=
    " 5":K$=" 6":L$=" 7":M$=" 8"
20  N$=" 9":O$="10":P$="11":Q$="12":R$="13":
    S$="14":T$="15":U$="16"
25  V$="17":W$="18":X$="19":Y$="20":Z$="21":
    A$(27)="22":A$(28)="23"
30  A$(29)="24":A$(30)="25":A$(31)="26":A$(32)=
    "27":A$(33)="28":A$(34)="29"
35  A$(35)="30":A$(36)="31"
40  INPUT "MONTH:";A,"YEAR:";B:E=621048:
    C=365.25
45  IF A < = 2 LET D=INT(30.6*(A+13))+INT(C*
    (B-1))-E:GOTO 55
50  D=INT(30.6*(A+1))+INT BC-E
55  IF D > 146097 LET D=D-1
60  IF D < = 73047 LET D=D+1:IF D < = 36522 LET
    D=D+1
70  D=D/7:D=INT(7*(D-INT D)+1.49)
75  IF (A=4)+(A=6)+(A=9)+(A=11) LET C=30
80  IF (A=1)+(A=3)+(A=5)+(A=7)+(A=8)+(A=10)+
    (A=12) LET C=31
90  IF A=2 LET C=28:IF (B/4=INT(B/4))+(B/E2 < >
    INT(B/E2))=2 LET C=29
95  IF A=2 IF B=2E3 LET C=29
105 FOR E=1 TO D-1:A$(E+36)=" -":NEXT E
110 FOR E=1 TO C:A$(D+E+35)=A$(E+5):NEXT E
120 BEEP 3:PRINT " S M T W T F S"
125 PRINT A$(37);A$(38);A$(39);A$(40);A$(41);
    A$(42);A$(43)
130 PRINT A$(44);A$(45);A$(46);A$(47);A$(48);
    A$(49);A$(50)
135 PRINT A$(51);A$(52);A$(53);A$(54);A$(55);
    A$(56);A$(57)
140 PRINT A$(58);A$(59);A$(60);A$(61);A$(62);
    A$(63);A$(64)
145 PRINT A$(65);A$(66);A$(67);A$(68);A$(69);
    A$(70);A$(71):PRINT A$(72);A$(73):END
```

If you have a printer for your Radio Shack TRS-80 or Sharp PC1211 PC, then use the main listing whose output statements are formatted to "squeeze" each week into a 16-character line. If you want to use the program on your PC without a printer, substitute the statement lines shown in the auxiliary listing.

Thanks for this highly useful program go to: *Emerich Auersbacher, 41 King Street – Apt. 2, Belleville, NJ 07109.*

Program *Calendar (Alterations For Use Without Printer)*

```
15  CLEAR:F$=" 1":G$=" 2":H$=" 3":I$=
    " 4":J$=" 5":K$=" 6":L$=" 7":M$=" 8"
20  N$=" 9":O$=" 10":P$=" 11":Q$=" 12":R$=
    " 13":S$=" 14":T$=" 15":U$=" 16"
25  V$=" 17":W$=" 18":X$=" 19":Y$=" 20":Z$=
    " 21":A$(27)=" 22":A$(28)=" 23"
30  A$(29)=" 24":A$(30)=" 25":A$(31)=" 26":
    A$(32)=" 27":A$(33)=" 28":A$(34)=" 29"
35  A$(35)=" 30":A$(36)=" 31"
105 FOR E=1 TO D-1:A$(E+36)=" - ":NEXT E
120 BEEP 3:PRINT " S  M  T  W  TH  F  S"
```

PROGRAM CALCULATES RELATIVE HUMIDITY & DEW POINT

This program determines the relative humidity (in percent of saturation) and the dew point. The raw inputs to the program are the temperatures of a combination wet bulb/dry bulb thermometer as well as the atmospheric pressure. This program is derived from work initially conducted by Dr. Scott Williams of Annapolis, Maryland.

You can construct a simple dry-bulb and wet-bulb psychrometer at home. Separate two thermometers by an inch or more using a plastic or wood spacer. Cover the bulb of one of the thermometers with a closely-fitted "sock." Wet the sock thoroughly with distilled water. (You can get distilled water as run-off from your air conditioner.) Do not use water straight from your drinking tap. Doing so can result in large errors.

Attach the thermometers to a short piece of string and swing them rapidly through the air for about 30 seconds in order to take a set of readings.

Remember that the dew point (the temperature of a surface at which condensation will begin to occur) is a better index than the relative humidity, since it usually does not vary as the surroundings warm or cool.

```
10 INPUT "DRY BULB TEMP, C";A
20 INPUT "WET BULB, C";B
30 INPUT "PRESSURE, MB";C
40 H=B:GOSUB 500
50 E=J-(0.00066*(1+0.00115*B)*C*(A-B)
60 H=A:GOSUB 500
70 D=E*100/J
80 PRINT " R.H. ",D
90 F=LOG (E/6.1078)
100 G-237.3*F/(7.5-F)
110 PRINT "DEW PT",G
120 END
500 J=6.1078*10^((7.5*H)/(237.3+H))
510 RETURN
```

To use the program, simply type RUN and input the data requested. Both relative humidity and the dew point will be displayed.

This program provided by: *James K. Sparkman, Jr., 3917 Birdsville Road, Davidsonville, MD 21035.*

LOW PASS FILTER DESIGN

The program shown here will aid in the choosing of component values for a second order low pass filter. It will also calculate the theoretical frequency response of the filter so that you can guage its expected performance.

The program was submitted by: *Hank Librach, 52 Bulkley Drive, Fairfield, CT 06430.*

The program will prompt the user to input the desired filter pass-band gain, cutoff frequency in Hertz and the desired damping. You also select a value for capacitor C_2 (as shown in the accompanying circuit diagram). The remaining components are then determined by the program.

The filter transfer function and other relationships assumed by the design program are:

$$\frac{E_o}{E_{in}} = \frac{-1/(R_1R_3C_1C_2)}{S^2 + (1/R_1 + 1/R_2 + 1/R_3)(1/C_1)S + 1/(R_2R_3C_1C_2)}$$

$$K(s) = \frac{-H_0\omega_0{}^2}{S^2 + \alpha\omega_0 S + \omega_0{}^2}$$

$\alpha = 2\zeta$ $\quad$ ζ = damping factor

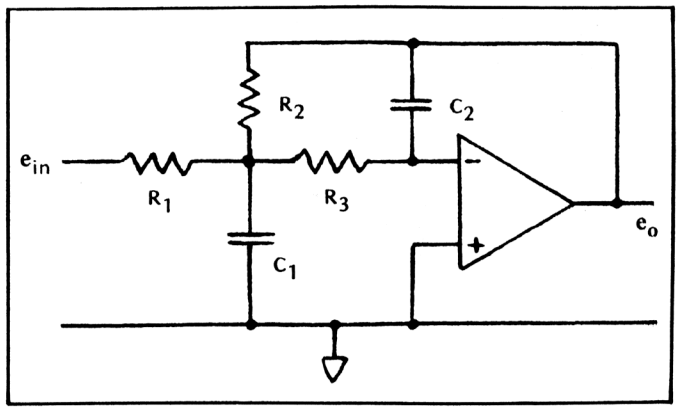
Formula parameters are assigned to program variables as follows:

H_0	–	H
F_0	–	F
ζ	–	Z
C_1	–	A
C_2	–	B
R_1	–	C
R_2	–	D
R_3	–	E

Program *Low Pass Filter Design*

```
10:PAUSE "LOW P
   ASS FILTER"
20:INPUT "PASSB
   AND GAIN=?";
   H
30:INPUT "CUTOF
   F FREQ. HZ.=
   ? ";F
40:INPUT "DESIR
   ED DAMPING=?
   ";Z
50:INPUT "CHOOS
   E VALUE FOR
   C2=?";B
60:A=(1+H)*B/(Z
   *Z)
70:D=Z/(2*π*F*B
   ):C=D/H:E=D/
   (H+1)
80:G=1/(C*E*A*B
   ):I=(1/C+1/D
   +1/E)/A:M=1/
   (D*E*A*B)
90:PAUSE "COMPO
   NENT VALUES
   ARE:"
100:PRINT USING
    "#.##^";"C1=
    ";A
105:PRINT "C2=";
    B
110:PRINT "R1=";
    C
115:PRINT "R2=";
    D
117:PRINT "R3=";
    E
120:PAUSE "FREQ.
    RESPONSE:"
130:INPUT "INPUT
    F=";F
135:J=4*π*π*F*F:
    M=ABS (N-J)
140:K=-G/(J(M*M+
    J*I*I))
145:L=20*LOG (
    ABS K)
150:PRINT USING
    "#.##^";"K="
    ;K
155:PRINT "K(DB=
    )";L
160:GOTO 130
```

Schematic *Low Pass Filter*



POLYNOMIAL ARITHMETIC

You can use this program to multiply or divide polynomials. It will also compute integer powers of polynomials.

Instructions

Begin as follows with the PC in the DEF mode:

SHIFT M to multiply polynomials.
SHIFT D to divide.
SHIFT N to find Nth power. (N must be an integer > 1.)

Next, input the data for each polynomial degree as prompted. The coefficients of the polynomial should be entered in order of decreasing powers. If you lose your place, just press the ENTER key without any data. This will give you a prompt of the degree of the term you should be entering.

As an example, consider the division of the polynomial: $6X^6+7X^5+11X^4+30X^3+10X^2+3X-7$ by the polynomial: $3X^2+5X+2$. First press SHIFT D, then enter data in response to the prompts as shown:

```
NUM DEG? 6
?        6
?        7
?        11
?        30
?        10
?        3
?        -7
DEN DEG? 2
?        3
?        5
?        2
```

The results are then displayed as:

```
QUO:
DEG 4, 2
DEG 3, -1
DEG 2, 4
DEG 1, 4
DEG 0, -6
REM:
DEG 1, 25
DEG 0, 5
```

This shows that the quotient is $2X^4-1X^3+4X^2+4X-6$, with a remainder of $25X+5$.

As another example, consider finding: $(2X^2-3X+5)^5$. In this case, start by pressing SHIFT N, then continue as follows:

```
DEGREE?  2
?        2
?        -3
?        5
POWER?   5
```

It will take about a minute and a half on a Sharp PC-1211 for the result to be obtained. The answer in this case is: $32X^{10}-240X^9+1120X^8$

$-3480X^7+8210X^6-14643X^5+20525X^4-21750X^3+17500X^2-9375X+3125$.

Restrictions

Calculated polynomials must be of degree less than 100.

Also, when multiplying polynomials, two times the degree of the first polynomial plus the degree of the second, must not exceed 117.

And, for division, the sum of the degrees of the numerator and the denominator must not exceed 117.

Plus, when calculating Nth powers, the product of (N+1) times the degree of the given polynomial must not exceed 118.

An error message results if these restrictions are not followed.

This program submitted by: *Norlin Rober, 407 North 1st Avenue, Marshalltown, IA 50158.*

Program *Polynomial Arithmetic*

```
10:"N"CLEAR :
   INPUT "DEGRE
   E? ";D:A=5:
   GOSUB 30:
   INPUT "POWER
   ? ";C:FOR A=
   5TO B:A(A+D+
   1)=A(A):NEXT
   A:FOR A=2TO
   C
11:FOR B=AD+A+4
   TO D+6STEP -
   1:FOR C=B+1
   TO C+D:A(C)=
   A(C)+A(B)A(C
   -B+4):NEXT C
   :A(B)=-B:NEXT
   B
12:FOR B=BTO AD
   +D+T:A(B)=A(
   B+1):NEXT B:
   NEXT A:A=D+6
   :B=B-1:BEEP
   1
20:FOR D=ATO B:
   C=B-D:PRINT
   "DEG";USING
   "###";C;", "
   ;USING ;A(D)
   :NEXT D:END
30:B=A+D:FOR A=
   ATO B
31:INPUT A(A):
   NEXT A:
   RETURN
32:C=B-A:PAUSE
   "DEGREE ";C:
   GOTO 31
40:"M"CLEAR :
   INPUT "DEG O
   F 1ST? ";E:A
   =6:D=E:GOSUB
   30:INPUT "
   DEG OF 2ND?
   ";D:A=E+7:
   GOSUB 30:FOR
   A=ATO E+7
   STEP -1
41:FOR B=A+1TO
   B+E:A(B)=A(B
   )+A(A)A(B-A+
   5):NEXT B:A(
   A)=0:NEXT A:
   A=E+8:B=B+D:
   BEEP 1:GOTO
   20
50:"D"CLEAR :
   INPUT "NUM D
   EG? ";D:A=D
   E=D+7:GOSUB
   30:INPUT "DE
   N DEG? ";D:A
   =E:GOSUB 30:
   PRINT "QUO:
51:IF D+7>E
   PRINT 0:A=6:
   GOTO 54
52:FOR A=6TO E-
   D-1:C=A(A)/A
   (E):IF DFOR
   B=A+1TO A+D:
   A(B)=A(B)-CA
   (B+E-A):NEXT
   B
53:B=E-D-A-1:
   PRINT "DEG";
   USING "###";
   B;", ";USING
   ;C:NEXT A:A=
   A+SGN D
54:IF DPRINT "R
   EM:":B=E-1:
   GOTO 20
```

HAVE YOU HEARD...

About the General who asked his PC the all important question, "Will we win the next war or will we lose it?"

The little PC churned away for a few minutes, then finally displayed its answer: "YES!"

"YES *what*?" demanded the furious General.

"YES *SIR!*" responded the PC.

ACCOUNTS RECEIVABLE

This program was provided by: *Mr. H. Nath, 101/H Block 'F', New Alipore, Calcutta – 700 053, India.* He supplements the program with the following information.

Purpose

This program is designed to assist me during visits to business customers. It will display up to six bills for each of three companies. It can also display sub-totals by customer. Since it may be used with a printer, I sometimes use it to present a customer with an on-the-spot bill! The information held in the PC may also be saved on a tape cassette and recalled for later use or updating.

Operation

The program should be executed with the Sharp PC-1211 or equivalent PC in the DEF mode. Press SHIFT/Space to display a menu of program options.

SHIFT/A is used to enter data, either from the keyboard or from a tape, as well as to save data on a tape.

The initial query by the computer enables the operator to select the desired option: to load data from a tape, save data to a tape or input data from the keyboard. Respond to the query:

LD/SVE DATA TAPE? L/S/N

with the letter N followed by the ENTER key if you simply want to input data from the keyboard.

Respond to the query for a company name using a maximum of 7 characters. Press ENTER.

The display will flash:

NEW FILE
OLD FILES ARE

and then display the number 1. This signifies that it is ready for the first entry for this company. (It would also show the number of the first bill if it had been assigned previously.)

Press ENTER. The computer will query:

ALTER? Y/N

If you input Y at this point, the program will clear out *all of the remaining memories for this company.* This can take as long as 13 seconds, depending on which bill you are examining.

Next, the program will ask you for the bill numbers, dates and dollar amounts. Enter these in sequence as prompted. Up to six sets of entries may be made under a company name. If you do not want to enter as many as six bills, then press SHIFT/X to exit the routine.

When six sets of entries have been made, the program will automatically flash:

NO ROOM

and exit to the menu portion of the program.

By the way, after asking for each item of data, the computer will display:

ERROR? SHFT Z

Press the ENTER key if you have not made an error in the entry. Press SHFT/Z if you want to re-enter the data. *[I found this feature quite irritating and would suggest that line 2 be changed to a PAUSE statement or eliminated. The correction capability would still be available, but the tediousness of having to press the ENTER key an extra time after every single entry is then eliminated. – N.W.]*

Similar entries can be made for two more companies.

Once data has been loaded, you use the SHIFT/B option to output the information. When this option is selected, you once again have the opportunity to load or save the data using a tape cassette machine.

Next, the program asks for the name of the company you wish to review. Enter the name of a company whose bills are in the PC. The program will check to make sure the name exists in its files. If not, the query repeats. Once a valid company name has been inputted, the program asks:

PRINTOUT Y/N?

Answer Y if you are using a printer with your PC. (Insert the name of your own business in line 50 of the program!) The program will now display the bill numbers, dates and amounts for the company you

Program *Accounts Receivable*

```
1   "X" END
2   PRINT "ERROR? SHFT Z":RETURN
3   G=G+1:RETURN
4   INPUT "ALTER? Y/N ";F$:RETURN
5   INPUT "CO. NAME? ";E$:RETURN
6   PAUSE "NO ROOM":GOTO 38
7   IF F$="Y" PRINT " "
8   RETURN
9   IF G=2 LET G=9
10  IF G=3 LET G=27
11  IF G=4 LET G=45
12  RETURN
13  FOR A=1 TO 18:A(G)=0:GOSUB 3:NEXT A:
    G=G-18:RETURN
14  INPUT "LD/SVE DATA TAPE?L/S/N ";H$:
    IF H$="L" INPUT # "RCD":RETURN
15  IF H$="S" PRINT # "RCD"
16  RETURN
18  "Z" GOTO H
20  "S" PRINT "SUB-TOTAL=$ ";A:GOTO 57
22  IF G=27 GOTO E
23  IF G=45 GOTO E
24  IF G=63 GOTO E
25  RETURN
30  FOR G=2 TO 4:IF E$=A$(G) GOTO A
32  NEXT G:RETURN
34  USING :PRINT H;" ";A$(G):GOSUB 4:IF F$=
    "Y" GOTO A
36  RETURN
38  " " PRINT "A/CS RECEIVABLE"
39  PRINT "SHFT A: INPUT"
40  PRINT "SHFT B: OUTPUT"
41  PRINT "SHFT S: SUB-TOTAL"
42  PRINT "SHFT X: EXIT":GOTO 38
44  "B" GOSUB 14
46  GOSUB 5:A=50:GOSUB 30
48  PAUSE "NO SUCH FILE":GOTO 46
50  INPUT "PRINTOUT? Y/N ";F$:IF F$="Y"
    PRINT "XYZ INC.":GOSUB 7:PRINT "A/C.";
    A$(G)
52  GOSUB 9:A=0:E=61:USING "########.##"
54  GOSUB 7:PRINT "BILL NO.";A$(G):GOSUB 3
55  PRINT "DATE ";A$(G):GOSUB 3
56  A=A+A(G):PRINT "$ ";A(G)
57  IF G=62 IF A(G) GOTO 61
58  GOSUB 3:H=G+2:IF A(H)=0 GOTO 61
60  GOSUB 22:GOTO 54
61  IF F$="Y" GOSUB 7:PRINT "TOTAL=":
    PRINT "$ ";A:END
62  PRINT "TOTAL=$ ";A:END
64  "A" GOSUB 14
66  GOSUB 5:A=78:GOSUB 30
68  PAUSE "NEW FILE":PAUSE "OLD FILES ARE"
69  H=1:G=2:A=86
70  GOSUB 34
74  H=H+1:GOSUB 3:IF G=5 GOTO 6
76  GOTO 70
78  PAUSE "OLD FILE":PAUSE "BILL NO.S ARE":
    GOSUB 9:H=1:A=88
80  GOSUB 34
84  G=G+3:H=H+1:E=6:GOSUB 22:GOTO 80
86  A$(G)=E$:GOSUB 9:GOSUB 13
88  H=88:INPUT "BILL NO.? (7 CHAR) ";A$(G):
    GOSUB 2:GOSUB 3
90  H=90:INPUT "DATE? (MMDD-YY) ";A$(G):
    GOSUB 2:GOSUB 3
92  H=92:INPUT "$=";A(G):GOSUB 2:GOSUB 3
94  E=6:GOSUB 22:GOTO 88
```

		1ST COMPANY						2ND COMPANY						3RD COMPANY					
STORAGE SEQUENCE		1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
A$(...)	BILL NUMBER	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60
A$(...)	DATE	10	13	16	19	22	25	28	31	34	37	40	43	46	49	52	55	58	61
A(...)	AMOUNT	11	14	17	20	23	26	29	32	35	38	41	44	47	50	53	56	59	62

requested. When all the bills for a firm have been displayed, the program will give a total of all the bills.

If you are not using a printer, press the ENTER key after each item has been displayed.

You can obtain interim totals. When the program is displaying the amount of an invoice, press SHIFT/S. If the program was displaying the amount of the third bill for a company, pressing SHIFT/S would result in a display of the sub-total of the first three bills for that firm. Press the ENTER key to continue outputting data after using the SHIFT/S option. (The SHIFT/S option should only be used when the amount of a bill is being displayed.)

This program, as shown in the accompanying listing, leaves 317 steps of memory. At least 288 steps are needed to hold the data for 18 bills. Variables A through H are used by the operating portion of the program. Data elements are stored in array elements as shown in the accompanying table.

SHIFTY WORDS

David Motto, 3639 Roosevelt, Jackson, MI 49203, submitted this short entertainment program.

What do the words PIT, ATE and HAL have in common? They can all be traced back to IBM. No, that large computer company didn't coin the use of those words. They are derived by shifting the letters in 'IBM' through the alphabet. For example, if I becomes J, B becomes C and M becomes N, then IBM is transformed to JCN. Continuing this process yields some interesting words.

For instance, JOHN becomes PUNT. RUN transforms to FIB. OPEN becomes STIR. Want to take a look at the situation? Just key this program into your 'CAB' and plug in some words!

Operation

Place the PC in the DEF mode and press SHIFT/Space. Key in a word that you want to try shifting. A word must not exceed 10 characters. Also, note that you key in one letter at a time, pressing ENTER after each character. Pressing ENTER alone terminates the word. After the original word has been inputted, the program automatically shifts all the letters and displays the new arrangement. If the display is too fast for your tastes, change the PAUSE statement in line 6 to PRINT. You will then have each arrangement displayed until you press the ENTER button.

Program *Shifty Words*

```
 1:" "CLEAR :
   PAUSE "INPUT
   A WORD"
 2:K=K+1:INPUT
   "LETTER? ";A
   $(K):IF A$(K
   )="="THEN 4
 3:IF K<11THEN
   2
 4:A(K)=0:L=K-1
 5:FOR M=1TO 26
   :FOR K=1TO L
   :GOSUB A$(K)
   :NEXT K
 6:PAUSE A$;B$;
   C$;D$;E$;F$;
   G$;H$;I$;J$:
   NEXT M
 7:GOTO 1
11:"A"A$(K)="B"
   :RETURN
12:"B"A$(K)="C"
   :RETURN
13:"C"A$(K)="D"
   :RETURN
14:"D"A$(K)="E"
   :RETURN
15:"E"A$(K)="F"
   :RETURN
16:"F"A$(K)="G"
   :RETURN
17:"G"A$(K)="H"
   :RETURN
18:"H"A$(K)="I"
   :RETURN
19:"I"A$(K)="J"
   :RETURN
20:"J"A$(K)="K"
   :RETURN
21:"K"A$(K)="L"
   :RETURN
22:"L"A$(K)="M"
   :RETURN
23:"M"A$(K)="N"
   :RETURN
24:"N"A$(K)="O"
   :RETURN
25:"O"A$(K)="P"
   :RETURN
26:"P"A$(K)="Q"
   :RETURN
27:"Q"A$(K)="R"
   :RETURN
28:"R"A$(K)="S"
   :RETURN
29:"S"A$(K)="T"
   :RETURN
30:"T"A$(K)="U"
   :RETURN
31:"U"A$(K)="V"
   :RETURN
32:"V"A$(K)="W"
   :RETURN
33:"W"A$(K)="X"
   :RETURN
34:"X"A$(K)="Y"
   :RETURN
35:"Y"A$(K)="Z"
   :RETURN
36:"Z"A$(K)="A"
   :RETURN
```

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FROM THE WATCH POCKET

How marvelously exciting it is to see the specifications on the Sharp PC-1500/Radio Shack PC-2. Note that while the two units are similar in functional capability, there are some cosmetic differences. I observed particularly that the Radio Shack PC-2 has the ENTER key just to the right of the SPACE key. I think they may regret that positioning. Touch typists are quite likely to strike the ENTER key accidently from force of habit, forgetting that it is not the space bar on a typewriter. Time will tell.

Functionally the units represent dreams coming true for many users. The BASIC interpreter has the additions necessary for a serious unit. Enough memory (16K) will eventually be installable in the pocket unit so that it can be highly functional, say, on a business trip, while holding a significant amount of data and perhaps two or three programs that can operate on that data. This is truly a pocketable unit with enough power to serve in a completely stand-alone situation.

Perhaps the most significant aspect is that the units have been designed with fully accessible input/output pathways. The direct memory access (DMA) capability is important, too. This means that the unit will be capable of operating as the central portion of a truly flexible, portable, individualized, personal computing system.

Individuals will be able to plug their own software-customized units into a variety of commonly shared applications/systems.

For instance, Radio Shack has already promised capability for the PC-2 to operate as a communications terminal. That means you will be able to plug into Source, Compuserve or any of a host of other networks, from anywhere that there is a telephone. With 16K of memory in your pocket, you will be able to download a goodly amount of data along with, say, a sophisticated analysis program. You might do this at the start of an airplane trip. Use the program and data as you traveled. Then offload the results at the end of your journey. What a way to increase your efficiency.

DMA capability means it is only a matter of time before there are intelligent disk systems for you to plug into. Remember, the PC-1500 is designed with software "hooks" so that an external "intelligent" device can expand the vocabulary of the BASIC language that is in the PC. Now, the essence of this capability is that you can considerably lower the individual cost of computing power by sharing the peripherals amongst a large group of users. You can put a few disk systems in an office. Perhaps one for each type of commonly needed task. Individual users then plug their own PCs into the appropriate disk system as they need the data/programs stored therein.

Make no mistake about it, there will be myriads of devices coming for you to plug your PC into. For instance, sources indicate that Sharp is working on devices such as a television interface. But even if Sharp or Radio Shack didn't provide such attachments, with those input/output (I/O) connectors accessible, lots of firms will soon be hard at work designing all kinds of useful gadgets for use with this new type of powerful pocket computer.

This and That

Radio Shack has reduced the regular price of its "old" TRS-80 PC to $169.95. I have seen discount houses selling the Sharp PC-1211 for less than $150.00. Also, look for deals where the CE-121 cassette interface comes with the PC at no charge.

I know of a number of PC users, yours truly included, who have several PCs around at all times. It is easier to keep several around loaded with all the programs one uses frequently, rather than to have to load in a new program three or four times a day. As the prices of PCs fall, this practice will undoubtably increase.

80 Microcomputing continues to be one of the few trade magazines that regularly publishes PC articles. The January issue had three articles including one by *Guerri F. Stevens* describing an exercise log program. Another program that helps keep track of a stock market portfolio and a program that determines the day of the week for any date since September 14, 1752, were also in the issue.

The March issue of **Popular Computing** has a nice multi-page article introducing and describing the original Radio Shack TRS-80 Pocket Computer. Better late than never, eh? — *Nat Wadsworth, Editor*